Mercury is the smallest and innermost planet in the Solar System. Its orbital period (about 88 Earth days) is less than any other planet in the Solar System. Seen from Earth, it appears to move around its orbit in about 116 days. It has no known natural satellites. It is named after the Roman deity Mercury, the messenger to the gods.

Partly because it has almost no atmosphere to retain heat, Mercury's surface temperature varies each day more than any other planet in the Solar System, ranging from 100 K (−173 °C; −280 °F) at night to 700 K (427 °C; 800 °F) during the day in some equatorial regions. The poles are constantly below 180 K (−93 °C; −136 °F). Mercury's axis has the smallest tilt of any of the Solar System's planets (about  1⁄30 degree), and its orbital eccentricity is the largest of all known planets in the Solar System. At its furthest point around the sun, Mercury is about 1.5 times as far from the Sun as it is at its closest. Mercury's surface is heavily cratered and similar in appearance to the Moon, indicating that it has been geologically inactive for billions of years.

Mercury is tidally or gravitationally locked with the Sun in a 3:2 resonance, and rotates in a way that is unique in the Solar System. As seen relative to the fixed stars, it rotates on its axis exactly three times for every two revolutions it makes around the Sun. Yet an observer on Mercury would see only one day every two years.

Because Mercury orbits the Sun within Earth's orbit (as does Venus), it can appear in Earth's sky in the morning or the evening, but not in the middle of the night. Also, like Venus and the Moon, it displays a complete range of phases as it moves around its orbit relative to Earth. Although Mercury can appear as a bright object when viewed from Earth, its proximity to the Sun makes it more difficult to see than Venus. Two spacecraft have visited Mercury: Mariner 10 flew by in 1974 and 1975; and MESSENGER, launched in 2004, orbited Mercury over 4,000 times in four years, before exhausting its fuel and crashing into the planet's surface on April 30, 2015.

Venus is the second planet from the Sun, orbiting it every 224.7 Earth days. It has the longest rotation period (243 days) of any planet in the Solar System and rotates in the opposite direction to most other planets – so it looks like the sun is moving backwards across the darkened sky. It has no natural satellite. It is named after the Roman goddess of love and beauty. It is the second-brightest natural object in the night sky after the Moon, reaching an apparent magnitude of −4.6, bright enough to cast visible shadows. Because Venus orbits within Earth's orbit it is an inferior planet and never appears to venture far from the Sun.

Venus is a terrestrial planet and is sometimes called Earth's "sister planet" because of their similar size, mass, proximity to the Sun, and composition. It is radically different from Earth in other respects. It has the densest atmosphere of the four terrestrial planets, consisting of more than 96% carbon dioxide. The atmospheric pressure at the planet's surface is 92 times that of Earth, or roughly the pressure found 900 m (3,000 ft) underwater on Earth. Venus is by far the hottest planet in the Solar System, with a mean surface temperature of 735 K (462 °C; 863 °F), even though Mercury is closer to the Sun. Venus is shrouded by an opaque layer of highly reflective clouds of sulfuric acid, preventing its surface from being seen from space in visible light. It may have had water oceans in the past, but these would have vaporized as the temperature rose due to a runaway greenhouse effect. The water has probably photodissociated, and the free hydrogen has been swept into interplanetary space by the solar wind because of the lack of a planetary magnetic field. Venus's surface is a dry desertscape interspersed with slab-like rocks and is periodically resurfaced by volcanism.

As one of the brightest objects in the sky, Venus has been a major fixture in human culture for as long as records have existed. It was the first planet beyond Earth visited by a spacecraft (Mariner 2) in 1962, and the first to be successfully landed on (by Venera 7) in 1970. Venus's thick clouds render observation of its surface impossible in visible light, and the first detailed maps did not emerge until the arrival of the Magellan orbiter in 1991. Plans have been proposed for rovers or more complex missions, but they are hindered by Venus's hostile surface conditions.

Earth is the third planet from the Sun, the densest planet in the Solar System, the largest of the Solar System's four terrestrial planets, and the only astronomical object known to harbor life. According to radiometric dating and other sources of evidence, Earth formed about 4.54 billion years ago. Earth gravitationally interacts with other objects in space, especially the Sun and the Moon. During one orbit around the Sun, Earth rotates about its axis 366.26 times, creating 365.26 solar days or one sidereal year. Earth's axis of rotation is tilted 23.4° away from the perpendicular of its orbital plane, producing seasonal variations on the planet's surface within a period of one tropical year (365.24 solar days). The Moon is the Earth's only permanent natural satellite; their gravitational interaction causes ocean tides, stabilizes the orientation of Earth's rotational axis, and gradually slows Earth's rotational rate.

71% of Earth's surface is covered with water. The remaining 29% is land mass—consisting of continents and islands—that together has many lakes, rivers, and other sources of water that contribute to the hydrosphere. The majority of Earth's polar regions are covered in ice, including the Antarctic ice sheet and the sea ice of the Arctic ice pack. Earth's interior remains active with a solid iron inner core, a liquid outer core that generates the Earth's magnetic field, and a convecting mantle that drives plate tectonics.

Within the first billion years of Earth's history, life appeared in the oceans and began to affect the atmosphere and surface, leading to the proliferation of aerobic and anaerobic organisms. Some geological evidence indicates that life may have arisen as much as 4.1 billion years ago. Since then, the combination of Earth's distance from the Sun, physical properties, and geological history have allowed life to evolve and thrive. In the history of the Earth, biodiversity has gone through long periods of expansion, occasionally punctuated by mass extinction events. Over 99% of all the species of life that ever lived on Earth are extinct. Estimates of the number of species on Earth today vary widely; most species have not been described. Over 7.3 billion humans live on Earth and depend on its biosphere and minerals for their survival. Humanity has developed diverse societies and cultures; politically, the world is divided into about 200 sovereign states.

Mars is the fourth planet from the Sun and the second-smallest planet in the Solar System, after Mercury. Named after the Roman god of war, it is often referred to as the "Red Planet because the iron oxideprevalent on its surface gives it a reddish appearance. Mars is a terrestrial planet with a thin atmosphere, having surface features reminiscent both of the impact craters of the Moon and the valleys, deserts, and polar ice caps of Earth.

The rotational period and seasonal cycles of Mars are likewise similar to those of Earth, as is the tilt that produces the seasons. Mars is the site of Olympus Mons, the largest volcano and second-highest known mountain in the Solar System, and of Valles Marineris, one of the largest canyons in the Solar System. The smooth Borealis basin in the northern hemisphere covers 40% of the planet and may be a giant impact feature. Mars has two moons, Phobos and Deimos, which are small and irregularly shaped. These may be captured asteroids, similar to 5261 Eureka, a Mars trojan.

There are ongoing investigations assessing the past habitability potential of Mars, as well as the possibility of extant life. Future astrobiology missions are planned, including the Mars 2020 and ExoMarsrovers. Liquid water cannot exist on the surface of Mars due to low atmospheric pressure, which is about  6⁄1000 that of the Earth's, except at the lowest elevations for short periods. The two polar ice caps appear to be made largely of water. The volume of water ice in the south polar ice cap, if melted, would be sufficient to cover the entire planetary surface to a depth of 11 meters (36 ft). On November 22, 2016, NASA reported finding a large amount of underground ice in the Utopia Planitia region of Mars. The volume of water detected has been estimated to be equivalent to the volume of water in Lake Superior.

Mars can easily be seen from Earth with the naked eye, as can its reddish coloring. Its apparent magnitude reaches −2.91, which is surpassed only by Jupiter, Venus, the Moon, and the Sun. Optical ground-based telescopes are typically limited to resolving features about 300 kilometers (190 mi) across when Earth and Mars are closest because of Earth's atmosphere.

Jupiter is the fifth planet from the Sun and the largest in the Solar System. It is a giant planet with a mass one-thousandth that of the Sun, but two and a half times that of all the other planets in the Solar System combined. Jupiter is a gas giant, along with Saturn, with the other two giant planets, Uranus and Neptune, being ice giants. Jupiter was known to astronomers of ancient times. The Romans named it after their god Jupiter. When viewed from Earth, Jupiter can reach an apparent magnitude of −2.94, bright enough for its reflected light to cast shadows, and making it on average the third-brightest object in the night sky after the Moon and Venus.

Jupiter is primarily composed of hydrogen with a quarter of its mass being helium, though helium comprises only about a tenth of the number of molecules. It may also have a rocky core of heavier elements, but like the other giant planets, Jupiter lacks a well-defined solid surface. Because of its rapid rotation, the planet's shape is that of an oblate spheroid (it has a slight but noticeable bulge around the equator). The outer atmosphere is visibly segregated into several bands at different latitudes, resulting in turbulence and storms along their interacting boundaries. A prominent result is the Great Red Spot, a giant storm that is known to have existed since at least the 17th century when it was first seen by telescope. Surrounding Jupiter is a faint planetary ring system and a powerful magnetosphere. Jupiter has at least 67 moons, including the four large Galilean moons discovered by Galileo Galilei in 1610. Ganymede, the largest of these, has a diameter greater than that of the planet Mercury.

Jupiter has been explored on several occasions by robotic spacecraft, most notably during the early Pioneer and Voyager flyby missions and later by the Galileo orbiter. In late February 2007, Jupiter was visited by the New Horizons probe, which used Jupiter's gravity to increase its speed and bend its trajectory en route to Pluto. The latest probe to visit the planet is Juno, which entered into orbit around Jupiter on July 4, 2016. Future targets for exploration in the Jupiter system include the probable ice-covered liquid ocean of its moon Europa.

Saturn is the sixth planet from the Sun and the second-largest in the Solar System, after Jupiter. It is a gas giant with an average radius about nine times that of Earth. Although only one-eighth the average density of Earth, with its larger volume Saturn is just over 95 times more massive. Saturn is named after the Roman god of agriculture; its astronomical symbol (♄) represents the god's sickle.

Saturn's interior is probably composed of a core of iron–nickel and rock (silicon and oxygen compounds). This core is surrounded by a deep layer of metallic hydrogen, an intermediate layer of liquid hydrogen and liquid helium, and finally outside the Frenkel line a gaseous outer layer. Saturn has a pale yellow hue due to ammonia crystals in its upper atmosphere. Electrical current within the metallic hydrogen layer is thought to give rise to Saturn's planetary magnetic field, which is weaker than Earth's, but has a magnetic moment 580 times that of Earth due to Saturn's larger size. Saturn's magnetic field strength is around one-twentieth of Jupiter's. The outer atmosphere is generally bland and lacking in contrast, although long-lived features can appear. Wind speeds on Saturn can reach 1,800 km/h (500 m/s), higher than on Jupiter, but not as high as those on Neptune.

Saturn has a prominent ring system that consists of nine continuous main rings and three discontinuous arcs and that is composed mostly of ice particles with a smaller amount of rocky debris and dust. Sixty-two moons are known to orbit Saturn, of which fifty-three are officially named. This does not include the hundreds of moonlets comprising the rings. Titan, Saturn's largest moon, and the second-largest in the Solar System, is larger than the planet Mercury, although less massive, and is the only moon in the Solar System to have a substantial atmosphere.

Uranus is the seventh planet from the Sun. It has the third-largest planetary radius and fourth-largest planetary mass in the Solar System. Uranus is similar in composition to Neptune, and both have different bulk chemical composition from that of the larger gas giants Jupiter and Saturn. For this reason, scientists often classify Uranus and Neptune as "ice giants" to distinguish them from the gas giants. Uranus's atmosphere is similar to Jupiter's and Saturn's in its primary composition of hydrogen and helium, but it contains more "ices" such as water, ammonia, and methane, along with traces of other hydrocarbons. It is the coldest planetary atmosphere in the Solar System, with a minimum temperature of 49 K (−224.2 °C), and has a complex, layered cloud structure with water thought to make up the lowest clouds and methane the uppermost layer of clouds. The interior of Uranus is mainly composed of ices and rock.

Uranus is the only planet whose name is derived from a figure from Greek mythology, from the Latinised version of the Greek god of the sky Ouranos. Like the other giant planets, Uranus has a ring system, a magnetosphere, and numerous moons. The Uranian system has a unique configuration among those of the planets because its axis of rotation is tilted sideways, nearly into the plane of its solar orbit. Its north and south poles, therefore, lie where most other planets have their equators. It could be said it is thus daytime all summer long, and night time all winter long. In 1986, images from Voyager 2 showed Uranus as an almost featureless planet in visible light, without the cloud bands or storms associated with the other giant planets. Observations from Earth have shown seasonal change and increased weather activity as Uranus approached its equinox in 2007. Wind speeds can reach 250 metres per second (900 km/h, 560 mph).

Neptune is the eighth and farthest known planet from the Sun in the Solar System. In the Solar System, it is the fourth-largest planet by diameter, the third-most-massive planet, and the densest giant planet. Neptune is 17 times the mass of Earth and is slightly more massive than its near-twin Uranus. Neptune orbits the Sun once every 164.8 years at an average distance of 4.50×109 km. It is named after the Roman god of the sea and has the astronomical symbol ♆, a stylised version of the god Neptune's trident.

Neptune is not visible to the unaided eye and is the only planet in the Solar System found by mathematical prediction rather than by observation. Unexpected changes in the orbit of Uranus led Alexis Bouvard to deduce that its orbit was subject to gravitational perturbation by an unknown planet. Neptune was subsequently observed with a telescope on 23 September 1846 by Johann Galle within a degree of the position predicted by Urbain Le Verrier. Neptune was visited by Voyager 2, when it flew by on 25 August 1989.

Neptune's composition is similar to that of Uranus and unlike those of the larger gas giants, Jupiter and Saturn. However, its interior, like that of Uranus, is primarily composed of ices and rock, which is why Uranus and Neptune are normally considered "ice giants" to emphasise this distinction. Traces of methane in the outermost regions in part account for the planet's blue appearance.

In contrast to the hazy, relatively featureless atmosphere of Uranus, Neptune's atmosphere has active and visible weather patterns. For example, at the time of the Voyager 2 flyby in 1989, the planet's southern hemisphere had a Great Dark Spot comparable to the Great Red Spot on Jupiter. These weather patterns are driven by the strongest sustained winds of any planet in the Solar System, with recorded wind speeds as high as 2,100 kilometres per hour (580 m/s; 1,300 mph). Because of its great distance from the Sun, Neptune's outer atmosphere is one of the coldest places in the Solar System, with temperatures at its cloud tops approaching 55 K (−218 °C). Neptune has a faint and fragmented ring system (labelled "arcs"), which was first detected during the 1960s and confirmed by Voyager 2.

Pluto (minor-planet designation: 134340 Pluto) is a dwarf planet in the Kuiper belt, a ring of bodies beyond Neptune. It was the first Kuiper belt object to be discovered. It is the largest known trans-Neptunian object by volume but is less massive than Eris, a dwarf planet in the scattered disc. Like other Kuiper belt objects, Pluto is primarily made of ice and rock and is relatively small—about one-sixth the mass of the Moon and one-third its volume. It has a moderately eccentric and inclined orbit. This means that Pluto periodically comes closer to the Sun than Neptune, but a stable orbital resonance with Neptune prevents them from colliding. Light from the Sun takes about 5.5 hours to reach Pluto at its average distance (39.5 AU).

Pluto was discovered by Clyde Tombaugh in 1930, and was originally considered the ninth planet from the Sun. After 1992, its planethood was questioned following the discovery of several objects of similar size in the Kuiper belt. In 2005, Eris, which is 27% heavier than Pluto, was discovered, which led the International Astronomical Union (IAU) to define the term "planet" formally for the first time the following year. This definition excluded Pluto and reclassified it as a member of the new "dwarf planet" category.

Pluto has five known moons: Charon (the largest, with a diameter just over half that of Pluto), Styx, Nix, Kerberos, and Hydra. Pluto and Charon are sometimes considered a binary system because the barycenter of their orbits does not lie within either body. The IAU has not formalized a definition for binary dwarf planets, and Charon is officially classified as a moon of Pluto.

On July 14, 2015, the New Horizons spacecraft became the first spacecraft to fly by Pluto. During its brief flyby, New Horizons made detailed measurements and observations of Pluto and its moons. On October 25, 2016, at 05:48 pm ET, the last bit of data (of a total of 50 billion bits of data; or 6.25 gigabytes) was received from New Horizons from its close encounter with Pluto on July 14, 2015.

Eris (minor-planet designation 136199 Eris) is the most massive and second-largest dwarf planet known in the Solar System. It is also the ninth-most-massive known body directly orbiting the Sun, and the largest known body in the Solar System not visited by a spacecraft. It is measured to be 2,326 ± 12 kilometers (1,445.3 ± 7.5 mi) in diameter. Eris is 27% more massive than dwarf planet Pluto, though Pluto is slightly larger by size. Eris' mass is about 0.27% of the Earth's mass.

Eris was discovered in January 2005 by a Palomar Observatory-based team led by Mike Brown, and its identity was verified later that year. It has one known moon, Dysnomia. As of February 2016, its distance from the Sun is 96.3 astronomical units (1.441×1010 km; 8.95×109 mi), roughly three times that of Pluto. With the exception of some comets, Eris and Dysnomia are currently the second-most-distant known natural objects in the Solar System, the farthest object being V774104 discovered in November 2015 at 103 AU.

Because Eris appeared to be larger than Pluto, NASA initially described it as the Solar System's tenth planet. This, along with the prospect of other objects of similar size being discovered in the future, motivated the International Astronomical Union (IAU) to define the term planet for the first time. Under the IAU definition approved on August 24, 2006, Eris is a "dwarf planet", along with objects such as Pluto, Ceres, Haumea and Makemake, thereby reducing the number of known planets in the Solar System to eight, the same as before Pluto's discovery in 1930. Observations of a stellar occultation by Eris in 2010 showed that its diameter was 2,326 ± 12 kilometers (1,445.3 ± 7.5 mi), not significantly different from that of Pluto. After New Horizons measured Pluto's diameter as 2372±4 km in July 2015, it was determined that Eris is slightly smaller in diameter than Pluto.